L. L. NARAYANA* & Digamber RAO**: **Contributions to the floral anatomy of Linaceae (13)*****

L. L. ナラヤナ*・D. ラオ**: アマ科の花部解剖学的研究 (13)***

In continuation of the previous publications on the floral anatomy of the family (Narayana 1964; Narayana & Rao 1966, 1969, 1971, 1973, 1974a, 1974b, 1976a, 1976b, 1977a, 1977b, 1977c, 1978a, 1978b) the present paper deals with the floral morphology and vascular anatomy of five species of *Ixonanthes* viz., *I. beccari* Hall. f., *I. crassifolia* Hall., *I. grandiflora* Hochr., *I. petiolaris* Blume, and *I. reticulata* Jack.

Morphology of the flower The flower is pedicellate, pentacyclic, pentamerous heterochlamydeous, regular, bisexual and hypogynous (Figs. 1, 12, 13, 24, 27, 36, 37, 47, 56, 60). The sepals show quincuncial aestivation (Figs. 9, 10, 22-24, 35, 36, 47, 54-56). The free petals show imbricate aestivation (Figs. 13, 14, 37, 40, 47, 59, 60, 63). The inner epidermal layer of the sepals consists of radially elongated cells with dense cytoplasm and prominent nuclei (Fig. 1). The androecium consists of ten stamens, the antipetalous being shorter (Figs. 40, 63). The anthers are dorsifixed and introrse (Figs. 1, 40, 63). There is a basal adnation between the perianth parts, staminal filaments and the disc (Figs. 8-12, 21-24, 34-36, 46, 47, 54-59). The disc consists of closely arranged, thin walled, parenchymatous cells, with dense cytoplasm and prominent nuclei. The ovary is 5-carpellary, syncarpous, 5-locular in *I. grandiflora* and *I. petiolaris* (Figs. 37, 38, 46-48) and 10-locular at the base in *I. beccari*, *I. crassifolia* and *I. reticulata* (Figs. 11, 25, 59). There are two pendulous, anatropous, bitegmic ovules in each loculus (Fig. 1, 13-15, 26, 27, 37, 38, 47, 48, 60, 61). It becomes unilocular towards the top (Figs. 28, 29, 39, 62). In *I. beccari*, five small cavities appear opposite the loculi at the top (Fig. 15). The common style shows a stylar canal lined by transmitting tissue (Figs. 1, 16, 30, 39, 40, 49, 63). The five stigmatic lobes bear glandular hairs (Fig. 1). The flower in *I. petiolaris*

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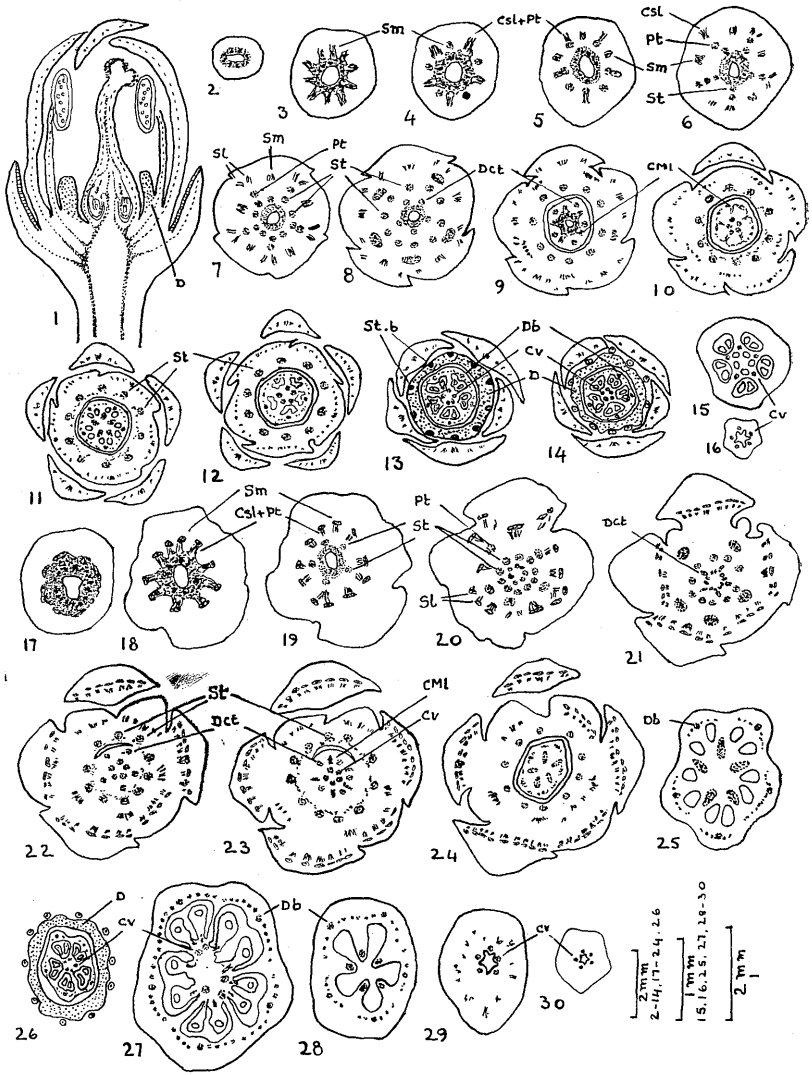
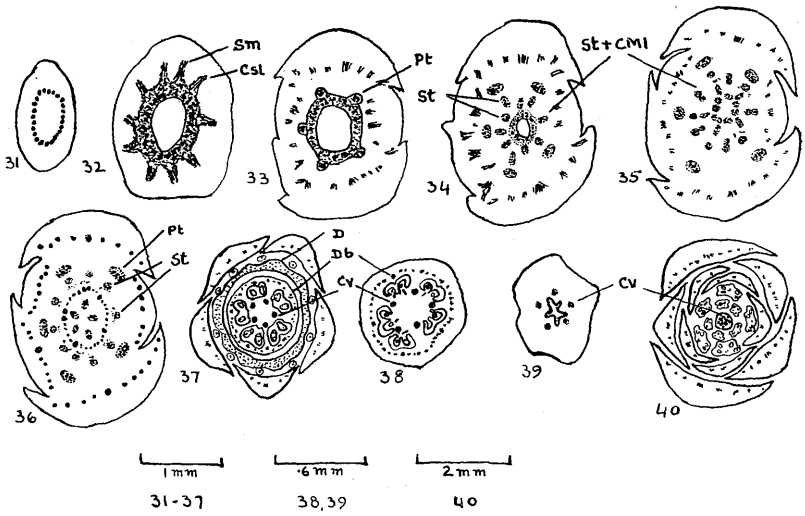


Figs. 1-30. *Ixonanthes beccari* (1-16) and *I. crassifolia* (17-30). 1: Semidiagrammatic longitudinal section of flower showing the course of vascular supply to the different floral parts. 2-30: Serial transverse sections of flowers, showing the origin and distribution of the traces to the different floral parts. Abbreviations. Sm: Sepal midrib trace, Csl: Common sepal lateral traces, Csl+Pt: common sepal lateral+petal traces, Sl: sepal lateral traces, D: disc, Pt: Petal traces, St: staminal traces, St. b: staminal bundle, Dct: dorsal carpellary trace, Db: dorsal bundles, CML: common median lateral traces, St+CML: staminal+common median lateral traces, CV: common ventrals bundles.

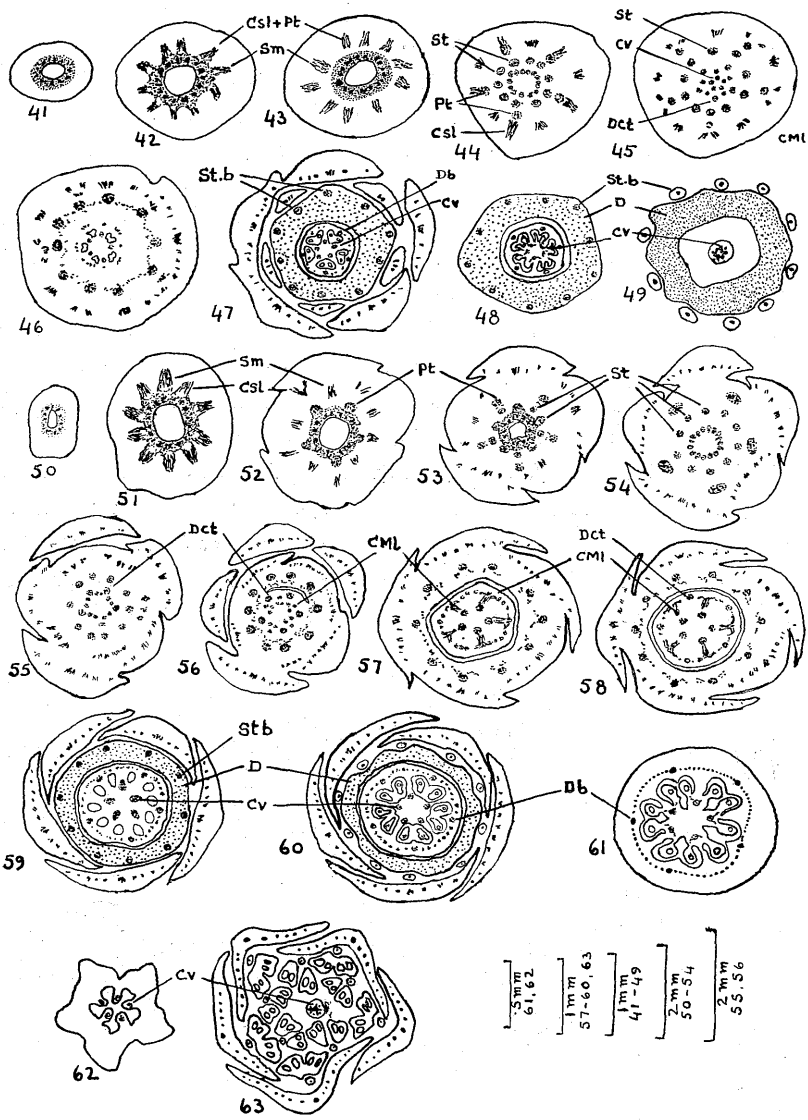
is perigynous, the loculi appearing even before the separation of sepals, petals, stamens and the disc (Fig. 46).

Floral anatomy The vascular tissue in the pedicel is ring like (Figs. 2, 17, 41, 50), except in *I. grandiflora* where it is in the form of a ring of closely placed bundles (Fig. 31). In *I. crassifolia* bands of sclerenchyma are present around the stele (Fig. 17). The traces for the perianth parts arise in two closely alternating whorls (Figs. 4-6, 18-20, 32, 33, 42-44, 51-53). There is connation between the lateral traces of adjacent sepals in *I. grandiflora* and *I. reticulata* (Figs. 32, 33, 51, 52). In *I. beccari*, *I. crassifolia* and *I. petiolaris* there is adnation between the common sepal lateral traces and the petal midribs. (Figs. 4-6, 18-20, 42-45). In *I. reticulata* the five petal traces give off five small branches on the inside which fade away at a higher level (Figs. 53, 54).

In *I. beccari*, *I. crassifolia*, *I. grandiflora* and *I. reticulata* the androecium is obdiplostemonous, as the traces for the antipetalous whorl of stamens are demarcated at a lower level (Figs. 6, 19, 34, 53). In *I. petiolaris* the staminal traces arise at one level (Fig. 44). The emerging staminal traces give off a number of branches, which enter the disc (Figs. 10, 11, 23, 35, 36, 45, 46,



Figs. 31-40. *Ixonanthes grandiflora*. Serial transverse sections of flowers, showing the origin and distribution of the traces to the different floral parts. Abbreviations as in Figs. 1-30.



Figs. 41-63. *Ixonanthes petiolaris* (41-49) and *I. reticulata* (50-63). Serial transverse sections of flowers, showing the origin and distribution of the traces to the different floral parts. Abbreviations as in Figs. 1-30.

56-58).

After the organization of the staminal supply five dorsal carpellary traces are organised along the petal radii (Figs. 8, 21, 35, 45, 55). The dorsal carpellary traces are followed by the common median lateral traces (Figs. 9, 10, 23, 55, 56), which, in *I. grandiflora*, are adnate with the antisepalous staminal traces (Fig. 35). The dorsal carpellary bundles usually divide into smaller bundles and these, after further divisions, enter the ovary wall along with the branches of the common median lateral traces (Figs. 10, 11, 24, 35, 36, 46, 47, 57-59). After supplying the ovules the ventral bundles continue into the style and terminate at the base of the stigmatic lobes (Figs. 1, 15, 16, 30, 40, 49, 63). The dorsal carpellary bundles, the median lateral bundles along with their branches in the ovary wall, fade away towards the top of the ovary (Fig. 1).

Summary and conclusions The flower is basically pentacyclic, pentamerous, regular and hypogynous with a tendency towards perigyny in the genus. The quincuncial sepals are three traced with tendency towards synsepaly. While there is connation between the lateral traces of adjacent sepals in *I. grandiflora* and *I. reticulata*, the common sepal lateral traces show adnation with petal midribs in *I. beccari*, *I. crassifolia*, and *I. petiolaris*. The free, imbricate petals are single traced.

The ten stamens show basal adnation with the intrastaminal disc. The antipetalous stamens are shorter. Perigyny is exhibited due to the basal adnation of perianth parts, staminal filaments and the disc. The androecium exhibits obdiplostemony in *I beccari*, *I. crassifolia*, *I. grandiflora* and *I. reticulata*, as the antipetalous staminal traces are demarcated earlier. In *I. petiolaris*, however, all the staminal traces arise at the same level. The intrastaminal disc is vascularised by the branches given off by the emerging staminal traces. The carpels are 5-traced in the genus. In *I. beccari* and *I. reticulata* there is connation between median lateral traces of adjacent carpels, and in *I. crassifolia*, *I. petiolaris* there is connation between the common median lateral traces and the common ventral bundles. Placentation is anatomically parietal. The common style shows a canal lined by transmitting tissue. The ventral bundles after supplying the ovules continue in the style, terminate at the base of glandular stigmatic lobes.

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アマ科の *Ixonanthes* 属5種の花の構造を研究した。花は5輪性で各輪は5数性である。がくは3本の維管束が入るが，*I. grandiflora* と *I. reticulata* とは側部維管束は隣りのがくの側部維管束と接着する。*I. beccari*, *I. crassifolia*, *I. petiolaris* では接着した側部維管束はさらに花弁の中央維管束と沿着する。10本の雄しべは花糸の基部が内側にある花盤と沿着し，また花弁の基部とも沿着するので子房周位の傾向を示す。*I. petioloris* では 10本の雄しべは同一輪上から維管束が分岐して入るが，他の4種では花弁と対をなす雄しべの維管束が先に分岐するので，10本の雄しべは逆二輪配列をしている。心皮はそれぞれ5本の維管束をもつ。そのうち *I. beccari* と *I. reticulata* とは心皮の隣りどうしの median lateral bundles は癒着し，*I. crassifolia* と *I. petiolaris* ではそれがさらに ventral bundles と癒着している。